Executive Summary
Backgrounder
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The Costs of Sprawl Reconsidered: What the Data Really Show

Wendell Cox and Joshua Utt

The Costs of Sprawl? The "anti-sprawl" movement has received much attention in recent years, and has been successful in implementing its "smart growth" policies in some areas. Much of the justification for the current campaign against the low-density (sprawling) urban development that Americans and Western Europeans prefer is based upon assumptions that it is more costly than the more dense development of central cities. A federally financed research project (*Costs of Sprawl*) concluded that we can no longer afford sprawling development and that failure to force more dense development in the next quarter-century would impose more than $225 billion in additional costs.

Current Urban Planning Assumptions. The urban planning profession generally contends that the following assumptions (called in this paper Current Urban Planning Assumptions) are compelling reasons why greater control should be exercised over land use to fight urban sprawl.

1. Lower spending will be associated with *higher* population densities.
2. Lower spending will be associated with *lower* rates of population growth.
3. Lower spending will be associated with *older* municipalities.

Research to Date. Most of the research on which these assumptions are based is theoretical, projecting standard costs into the future. It makes no attempt to test the actual expenditures of more dense, slower growing, and older municipalities compared to municipalities with the suburban land-use patterns that have developed over the past half-century. The research contained in this paper examines the actual data on municipal expenditures and finds that the Current Urban Planning Assumptions are unreliable and that other factors—principally, variations in employee compensation per capita—explain virtually all of the variation in municipal expenditures.

However, before describing this research, it is important to examine the *Costs of Sprawl* claims. Although $225 billion in additional costs sounds like a lot (and there are many questions regarding this claim), the cost is actually modest because it is spread over a quarter-century and an average of 115 million households. In fact, in the last 20 years, the average annual increase in local government expenditures in the United States has been 25 times the annual *Costs of Sprawl* projection.

Econometric Analysis. The source of data for this paper is the United States Bureau of the Census database for 2000. We used this database to conduct an econometric analysis that sought to

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identify the factors that are most important in explaining the differences in municipal expenditures. Data were available for more than 700 municipalities in the year 2000. We developed three econometric models.

The first, the General Government Model, was used to estimate the impact of factors such as population density, crime rates, and 11 others on municipal expenditures per capita. With respect to the Current Urban Planning Assumptions, no practical relationship was found between municipal expenditures per capita density, population growth rate, or community age. The impact of density on municipal expenditures was found to be statistically significant, but the predicted impact was trivial. Theoretically, if the nation were to reverse 40 years of suburbanization, the annual savings per capita would purchase a dinner for two at a moderately priced restaurant.

Further, the combination of factors that seemed likely to affect municipal spending (both those related to the Current Urban Planning Assumptions and others) explained less than 30 percent of the variation in municipal expenditures per capita. The other two econometric models showed that none of the Current Urban Planning Assumptions bore a statistically significant relationship to the variation in municipal wastewater charges or water charges. This is particularly significant, since these infrastructure functions are among those cited most often in claims that suburbanization imposes additional costs.

Nominal Analysis. A nominal (ranking) analysis of the actual data was also performed. The actual data indicate relationships considerably at variance with the Current Urban Planning Assumptions. The highest density, slowest growing, and oldest municipalities all had higher-than-average expenditures per capita. The oldest municipalities had the highest expenditures.

Employee Compensation. By far the largest expenditure category for municipalities is employee compensation. A further nominal analysis indicated that virtually all of the variation in municipal expenditures per capita could be explained by the variation in employee compensation. For example, the highest density quintile of municipalities spent $68 per capita each year more than the average. Wages and salaries in the same municipalities were $91 higher.

Special Interest Control and Entrenchment? In short, this analysis indicates that higher payroll costs are associated with larger, older municipalities. Local government employees have a significant, concentrated interest in improving their compensation and working conditions. This could be indicative of a political "entrenchment" that results from special interest control—an influence to which older municipalities would be more susceptible. Other special interests could exert similar influence, although employee compensation alone appears sufficient to account for the variation in municipal spending. It seems much more likely that the differences in municipal expenditures per capita are the result of political, rather than economic, factors—especially the influence of special interests.

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Over the past several years there has emerged in the United States an influential political movement whose purpose is to severely limit, or even prohibit, further suburbanization. This "anti-sprawl" movement has received much attention and has been successful in implementing its restrictive land-use policies in some areas. Much of the justification for the current campaign against the low-density (sprawling) urban development that Americans and Western Europeans[1] prefer is based upon assumptions that it is more costly than the more dense development of central cities.

Variously described as "smart growth," "growth management," or "New Urbanism," the movement would force people to live at higher densities, in multi-family units, townhouses, or clustered single-family developments—while placing significant restrictions on the expansion of suburban commercial development

The rationales offered for limiting suburban housing choices are many, various, and of questionable validity. At one point or another over the past half-decade, critics of suburban development have cited its adverse impact on "food security," wildlife, and air and water quality. Critics of suburban expansion even contend that suburbs contribute to serial killings, teenage angst, social alienation, low wages, obesity, asthma, and higher taxes. This last item, the belief that lower-density, "more sprawling" development fuels higher government expenditures, is the most common reason elected officials in many

Talking Points

- The anti-sprawl movement claims lower density (more sprawling), faster growing, and newer communities have higher government costs than higher density (less sprawling), slower growing, older communities.
- An econometric analysis of actual municipality data indicates that there is no practically significant difference in expenditures per capita between the more sprawling and less sprawling communities.
- In a nominal ranking analysis, the highest density, slowest growing, and oldest municipalities all had higher than average expenditures per capita. The oldest municipalities had the highest expenditures.
- Other factors—principally, variations in employee compensation per capita—explain virtually all of the variation in municipal expenditures.
- It seems likely that the differences in municipal expenditures per capita are the result of political, rather than economic, factors—especially the influence of special interests.

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municipalities adopt measures to limit housing growth in their communities.

Typical of the concern that low-density development raises municipal costs—and therefore local taxes—is a contention in a recent, federally funded study of sprawl and costs that claims the United States "no longer can pay for the infrastructure necessary to develop farther and farther out in metropolitan areas."[2]

Current Urban Planning Assumptions. The U.S. urban planning community has adopted several assumptions about suburbanization and local government expenditures. These are outlined below and are referred to as the Current Urban Planning Assumptions in this paper.

1. ***Lower* spending per capita will be associated with *higher* population densities.** Thus, it is presumed that the more densely developed a community is, the less costly it will be to provide government services on a per capita basis. Conversely, the more widely dispersed development is (as in a community in which houses are spread out on large lots), the higher will be local government expenditures per capita.
2. ***Lower* spending per capita will be associated with *lower* rates of population growth.** This is based upon the belief that the burden of building new infrastructure in newer, growing communities is greater than it would be to expand or use latent capacity in older, slower-growing communities.
3. ***Lower* spending per capita will be associated with *older* municipalities.** It is assumed, for example, that the existing infrastructure of older municipalities has latent capacity, can be expanded, or can be used more intensively for less than the costs of building infrastructure in newer, more sprawling municipalities (which are virtually always suburban). At least partially as a result of this belief, current urban planning theory places a priority on construction within highly developed areas (referred to as "infill" development) instead of in undeveloped areas (referred to as "greenfield" development).

Belief in these assumptions provides support to urban planners and others who are interested in limiting suburban development and, in extreme cases, outlawing development outside "urban growth boundaries" or designated "growth areas."

In fact, however, virtually all of the research on which the Current Urban Planning Assumptions are based is theoretical, projecting relative costs into the future without examining the actual expenditures that are being made today by municipalities of differing urban forms and ages. The analysis in this paper reviews actual municipal expenditure data in relation to the Current Urban Planning Assumptions. Among the findings:

- Based upon an econometric analysis of data from the year 2000 for more than 700 municipalities, we conclude that none of the Current Urban Planning Assumptions is associated with any practically significant variation in local government expenditures per capita. In addition, the econometric analysis is able to account for less than 30 percent of the variation in local government expenditures per capita. This indicates that other factors, not accounted for in the econometric formula, are more important.
- Based upon a nominal (ranking) analysis of the same dataset, we conclude that the Current Urban Planning Assumptions are almost 180 degrees opposite the reality of municipal expenditures. The highest density municipalities have higher than average expenditures per capita; the slowest growing municipalities have higher than average expenditures per capita; and the oldest municipalities have the highest expenditures of all per capita.

1. Urban sprawl is often thought of as an American phenomenon. In fact, sprawl has been occurring throughout the high-income world and much of the low- and middle-income world. Virtually all population growth in major Western European urban areas has been outside the urban cores for at least three decades, occurring mostly in suburban style settings.
2. Robert W. Burchell, *et al.*, *Costs of Sprawl—Revisited* (Washington, D.C.: National Academy Press, 1998), p. 3.

By far the largest expenditure for municipal governments is employee compensation. There were no reliable data for including this variable in the econometric analysis. Yet our nominal analysis indicates that virtually all of the variation between municipal expenditures per capita can be accounted for by differences in employee compensation per capita.

Table 1 B 1770

Projected Gross Additional Cost of Uncontrolled Development: 2000–2025

Function	Excess Cost (Billions)	Per Household Annually	Per Capita Annually
Sewer-Water	$12.6	$4.41	$1.63
Roadways	$109.7	$38.37	$14.16
Public Services	$105.1	$36.77	$13.57
Total	$227.4	$79.54	$29.36

Source: Calculated from *Costs of Sprawl—2000.*

Costs of Urban Sprawl: Research

Perhaps the most oft-quoted recent research attempting to estimate the relationship between sprawl and infrastructure costs was conducted by a team led by Professor Robert Burchell and funded under the auspices of the federal government's Transit Cooperative Research Program (TCRP). The project included two reports: *Costs of Sprawl—2000* and *The Costs of Sprawl—Revisited.*[3] *The Costs of Sprawl—2000* projected that from 2000 to 2025, America would incur $227.4 billion in gross additional costs for what the study terms "uncontrolled growth" (less dense, more sprawling growth) versus "controlled growth" (more dense, less sprawling growth). This equates to approximately $9.1 billion in gross additional costs per year.

The figure of $227.4 billion may seem large.[4] Yet in the context of 25 years and an average population of 115 million households, it is actually rather modest. The $227.4 billion would amount to only $80 per household annually, or $29 per capita. (See Table 1.) This includes:

- $4.41 per household (or $1.63 per capita) for additional sewer and water costs;
- $38.37 per household (or $14.16 per capita) for additional roadways; and
- $36.77 per household (or $13.57 per capita) for expanded public services.

Many growth critics have used these estimates as a measure of the cost that sprawl imposes on society. Advocates of smart growth policies have implied that these estimates represent the costs of continued low-density development on society. However, many of the purported costs are not imposed on society at all: They are private costs freely paid by the people who buy new houses.

The cost of sewer and water infrastructure in new developments is passed on to the buyer, and subsequent operation is typically funded with fees assessed on residents and businesses based upon use. Typically, new housing development infrastructure (local streets, curbs, sidewalks, storm and waste sewers, and water supply lines within the development) is paid for privately by the purchasers of new houses, having been built by developers or homebuilders. These are fully private costs that are paid for by persons who voluntarily move into new houses and apartments, having determined that they can afford such a move.

There are further indications that the projections from the *Costs of Sprawl—2000* are not "unaffordable," and actually are modest in comparison to other costs in the economy. Specifically:

- From 1980 to 2000 (inclusive), the increase alone in total personal income in the United States was nearly $27 trillion (in 2000 dollars), or $1.3 trillion per year.[5] This is more than

3. Robert W. Burchell, *et al.*, *Costs of Sprawl—2000*, Transportation Research Board, 2002.
4. In fact, as our research indicates, it appears that the cost of more dispersed municipal development is lower, not higher. This would call into question the $227.4 billion estimate.

140 times the $9.1 billion in average annual additional costs projected in *Costs of Sprawl—2000* for 2000 through 2025.[6]

- From 1980 to 2000 (inclusive), the total increase in local government expenditures in the United States was $4.5 trillion (in 2000 dollars adjusted for the increase in population), or $225 billion per year. This is approximately 25 times the $9.1 billion average additional public *and* private costs projected in *Costs of Sprawl—2000*.[7]

Municipal Expenditures: Econometric Analysis

Because the authors of the *Costs of Sprawl—2000* mix public and private expenditures that they claim are related to sprawl, the study's findings offer little guidance on one of the key public policy issues related to suburbanization: What are the actual, additional municipal costs that suburbanization imposes on the community at large, if any? This report will attempt to fill that void by conducting an econometric analysis (see box) of municipal spending patterns to determine what portion of municipal costs appear to be related to the impact of sprawl.

If the Current Urban Planning Assumptions are valid, the trends that *Costs of Sprawl—2000* identifies—having been underway for at least five decades—should reveal clearly the differences in expenditures between less sprawling and more sprawling areas. This means that older, higher density municipalities should have lower costs per capita than newer, lower density, more sprawling areas. These differences should be evident in the present spending patterns of local governments.

For an issue that has galvanized public debate in many communities throughout the country, there is little comprehensive, academic research on the actual relationship between land-use patterns and local government costs. The most recent research was published some time ago and is based upon early 1980s data. It was conducted by Professor Helen Ladd at Duke University, who performed an econometric analysis of growth measures and the actual public expenditures of 247 counties. She found that per capita expenditures on public services tend to *rise* as density rises and that higher population growth is associated with *lower* per capita local government expenditures—precisely the opposite of Current Urban Planning Assumption #1, above.[8]

Because the data used in her study are now more than two decades old, there is a need for more contemporary research on the factors that drive local government expenditures, especially in view of the predominant influence of "smart growth" urban planning theories. The purpose of this paper is to fill that gap with municipal cost data drawn from the 2000 Census.

Source of Data. Although the term "sprawl" has no precise definition, its most fundamental characteristic is lower population density. Smart growth advocates presume that building less sprawling, higher density communities results in lower government expenditures. If this is indeed the case, an analysis of municipal spending patterns across the country should show that as population densities go up, costs go down—and vice versa.

In order to reliably capture the impact of density on local government spending, we analyzed data for municipalities (cities and towns) rather than counties[9] because that is the level of government most affected by finance issues regarding utilities (wastewater and water) and general public services. The source of municipal financial data for the analysis in

5. Adjusted for population increase.
6. Estimated from U.S. Department of Commerce data. Assumes a constant rate of annual increase from 1980 to 2000.
7. Estimated from U.S. Census Bureau data. Assumes a constant rate of annual increase from 1980 to 2000.
8. Helen Ladd, "Population Growth, Density and the Costs of Providing Public Services," *Urban Studies* Vol. 29, No. 2 (1992), pp. 273–295.
9. This is not the case for other local units of general government, such as counties and townships. These generally include much rural (non-urban) land. As a result, density data for other local government units is not reflective of urban densities.

this paper is the U.S. Census Bureau government finance database for fiscal year 2000, which contains information for approximately 1,800 municipalities. Additional data for municipalities are available from other sources, such as the 2000 U.S. Census (demographic and density data) and the U.S. Department of Justice (crime rates). Another advantage of using municipal (rather than county) data is that municipal boundaries typically contain little rural space; therefore, the population density within those boundaries is generally similar to urban population density.

Because the current urban planning debate is principally focused on where development occurs within the nation's largest metropolitan areas, the municipalities analyzed in this study included only those within metropolitan areas of more than 1,000,000 residents in 2000.[10] Consolidated city-counties were not included, because such municipalities provide both city and county services and would be expected to have inherently higher expenditures as a consequence.[11]

The analysis in this paper does not include primary and secondary education costs. Most of the nation's primary and secondary education is provided by independent school districts that seldom match municipal (or county) boundaries. As a result, there is little, if any, broad demographic data specific to the geographical areas served by such districts. Related research indicates that, contrary to Current Urban Planning Assumption #2, elementary and secondary education expenditures tend to be lower in school districts with the greatest enrollment growth, and highest where there is the least growth.[12] Our research focuses on municipal costs in three categories:

- Government expenditures (all costs except for utilities and education);
- Municipally owned wastewater utility charges; and
- Municipally owned water utility charges.

Econometric Models. For purposes of this study, three econometric models[13] were developed to estimate the relationships between various factors and municipal expenditures:

- The *General Government Model* was developed to estimate the relationship between municipal current expenditures per capita and growth-influencing factors;
- *Wastewater Charges Model*; and
- *Water Utility Charges Model*.

The Wastewater Charges and Water Utility Charges models were developed to capture the impact of density, growth, and age of community on the cost of these functions. These are frequently cited in the urban planning literature as being upwardly affected by more sprawling development.

Another reason for analyzing utility charges separate from general government functions is that water and wastewater services are generally financed by user fees, rather than by the general tax revenues that finance most other municipal government operations. In fact, these utilities are not inherently government services: In many communities, regulated private companies provide such functions.[14]

General Government Model

The General Government Model estimates the impact of a number of factors on per capita municipal government expenditures, excluding utilities and

10. Metropolitan areas of more than 1,000,000 residents comprised approximately 58 percent of the nation's population in 2000 (2000 metropolitan definitions). The 49 such areas had a combined population of 163 million, out of a national total of 281 million (Table H-10).
11. As a result, jurisdictions such as New York, Philadelphia, San Francisco, Baltimore, St. Louis, Miami, New Orleans, Indianapolis, and Lexington, Kentucky were excluded.
12. Byron Schlomach and Wendell Cox, *A Look at School Facilities Funding in Texas,* Texas Public Policy Foundation, 2004 at *http://www.texaspolicy.com/pdf/2004-04-facilities.pdf* (June 15, 2004).
13. This research uses multi-linear regression analysis. Independent variables (such as population density) were chosen. These were theorized to have some impact on municipal expenditures per capita (the dependent variable).
14. Water and wastewater utilities in France also tend to be privately owned.

Econometric Models: Statistical Significance and "Practical Significance"

Our econometric analysis relies on the use of the "multiple linear regression model," a commonly used statistical analysis tool that measures the effect of a number of factors (*independent variables*) on a single factor (*dependent variable*). This paper attempts to estimate the association between independent variables thought to have an influence on municipal expenditures (such as population density and crime rate, as shown in Table 2) and the dependent variable of municipal government expenditures per capita.

The multiple linear regression models provide two types of results important to the analysis. First, the model estimates the coefficient on each independent variable. This coefficient measures the estimated impact of changes of the independent variable (such as average house value) on the dependent variable (such as average expenditures). Second, each coefficient is paired with a mathematically estimated level of confidence in the two variables' relationship. Economists generally require a confidence level of 95 percent, calling such a relationship "statistically significant." A statistically significant variable is a reliable predictor of the dependent variable, taking the other independent variables in the model as fixed.

Yet statistical significance (a reliable predictive relationship) does not mean that the relationship is of practical significance (economically or mathematically significant.)[1] An econometric model may find a statistically significant relationship between a variable and a result but that relationship may not be material. Statistical significance is a measure of the reliability of an association between one factor and another. However, the mathematical or practical effect may be either small or large.

Practical significance is calculated as the percent change in the dependent variable (in the case of the present research, municipal expenditures) divided by the percent change in the independent variable (for example, population density or median house age). Practical significance is virtually the same thing as "elasticity." For practical significance to exist, however, requires statistical significance. By definition, a relationship that is not statistically significant cannot be practically significant.

continued at Econometric Models ... *on next page*

1. In recent years several academic economists have turned their attention to the potential policy implications of an analytical process that may be putting too much weight into whether a relationship between economic variables is statistically significant—at the expense of other analytical relationships between variables. Specifically, they are examining whether the relationship revealed by statistical methods makes economic sense and whether the relationship is of a meaningful magnitude. One of the early studies on this subject was published by professors Deirdre McCloskey and Stephen Ziliak in the March 1996 issue of the *Journal of Economic Literature*. It was titled "The Standard Error of Regressions." A recent review of this academic debate was reviewed in the January 31, 2004, issue of *The Economist*, in an article titled "Signifying Nothing?" on page 76.

education. The model uses 13 factors that would be expected to influence local government expenditures (current and capital expenditures)[15] per capita. These include factors that test the Current Urban Planning Assumptions (population density, population growth, and community age as indicated by median house ages). There were sufficient data for 738 municipalities to be included in the General Government Model.[16] Table 2 lists the variables included in the General Government Model.

General Government Model Results. The results indicate that the 13 factors in the General

Econometric Models ... *continued from previous page*

If, for example, it were determined that there was a statistically significant association between higher house value and higher municipal spending, then the question of practical significance becomes important. If a 50 percent increase in average house value is associated with a 1 percent increase in municipal spending per capita, the elasticity would be 0.02, or two percent, which would not be considered of practical significance. If, on the other hand, a 50 percent increase in average house value is associated with a 25 percent increase in municipal spending per capita, the elasticity would be 0.50 (50 percent), which would be a number large enough to be practically significant.

These distinctions can be missed when statistical significance is overzealously characterized in such a way as to imply practical significance. One example is highly publicized recent research that found a statistically significant relationship between urban sprawl and obesity—but the actual weight differences predicted by the model were far from being practically significant. The difference in average weight between high-density central counties and low-density (more sprawling) suburban counties was predicted by the model to be less than one pound in many metropolitan areas.[2] Regrettably, in this case, advocates of government policies aimed at combating sprawl wittingly or unwittingly appear to have misled reporters and elected officials, who were led to believe that statistical significance, in and of itself, meant practical significance. It does not.

2. Barbara A. McCann and Reid Ewing, *Measuring the Health Effects of Sprawl,* Smart Growth America and the Surface Transportation Policy Project, September 2003.

Government Model explain approximately 29 percent of the variation in municipal expenditures, as revealed in Table 3.[17] This means that 71 percent of the variation in total expenditures is not explained by the factors included in the model, but rather by other influences which cannot be quantified or for which there are no available or accurate data. The conclusion is that, contrary to the theory, comparatively little of the variation in municipal costs is associated with the Current Urban Planning Assumptions. Other factors, which have not been identified, are more important.

As Table 3 reveals, 8 of the 13 factors were reliable predictors of either higher or lower municipal spending per capita (at a statistically significant 95 percent level of confidence). These factors are: poverty rate, local/state expenditure ratio, state and federal aid, density, persons per household, owner-occupied housing (percent of housing units occupied by owners rather than renters), median house value, and crime rate.

As the discussion in the box indicates, statistical significance does not necessarily denote practical significance. A factor may be a reliable predictor of an impact, but the impact itself may be small. Among the 13 growth-related factors analyzed in the General Government Model, practical significance varied widely. The local-to-state expenditure ratio[18] had the highest practical significance (a 100 percent increase in the ratio of local govern-

15. Current expenditures are the day-to-day costs of operations, such as employee compensation, materials and supplies, and professional service contracts. Capital expenditures are for construction and acquisition of assets, such as vehicles, data processing equipment, furniture, etc.

16. The municipalities in the sample contained 63 million people in 2000 (39 percent of the total population in metropolitan areas over 1,000,000).

17. R^2=0.29.

ment spending to total state and local government spending would be associated with a 55 percent increase in per capita expenditures—a practical significance of 55 percent). The other variables with comparatively high practical significance were persons per household (–42 percent), owner-occupied housing (–30 percent), crime rate (+25 percent) and median house value (+25 percent). The other reliably predictive (statistically significant) factors had practical significance less than 15 percent.[19]

Table 2 B 1770

Regression Variables

Variable	Definition
SPENDING	Municipal spending per capita (in thousands)
SEWER	Wastewater charges per capita (in thousands)
WATER	Water charges per capita (in thousands)
POV%	Percent of population below the poverty rate
POP2000	Population in 2000
HAGE	Median age of owner-occupied housing
L/SDGE	Ratio of local to state and local direct government expenditures
S&FAID$	Total of state and federal aid per capita (in thousands)
DENSITY	Population density (per square mile)
POP%	Percentage population change between 1990 and 2000
P/HHLD	Persons per household
OWNOCC%	Percent of housing occupied by owners
HOUSE$	Median house value (actual)
SR%	Percent of population over 65
AREA	Land area (square miles)
CRIME	Crime rate per capita (2000 or 2001 if not available for 2000)

All data 2000 except as noted.

Population Density. The results derived from the General Government Model are consistent with the Current Urban Planning Assumption #1 that associates higher densities with lower municipal government expenditures—but only weakly so. The relationship was statistically significant (99 percent), but there was little practical significance, which would indicate that higher population density is associated with only a small downward variation in municipal costs per capita. The mathematical significance or elasticity was 0.146: Each 10 percent increase in density could be expected to produce a 1.46 percent decrease in municipal expenditures per capita. For the average municipality, each 1,000 increase in population per square mile[20] is associated with a $43 per capita reduction in municipal expenditures. This is a minuscule expenditure decrease compared with the substantial increase in density required to trigger it. In other words, a virtually unprecedented increase in population density in an already urbanized area would trigger an decrease in expenditure equal to the price of dinner for two at a moderately priced restaurant.[21]

Population Growth. Population growth, the factor associated with Current Urban Planning Assumption #2 was not statistically significant and could not therefore be practically significant. Thus, the results from the model do not support Current Urban Planning Assumption #2, indicating no significant relationship between higher population growth and higher municipal expenditures per capita.

Median House Age. Median house age, the factor associated with Current Urban Planning Assumption #3 was not statistically significant and could not therefore be practically significant. Thus, the results from the model do not support Current Urban Planning Assumption #3, indicating no significant relationship between newer

18. This factor (local direct general expenditures as a percentage of state government plus local government direct general expenditures) was included to capture the differences (by state) in expenditure distribution between state and local governments.
19. Negative or positive.
20. Average population density of the sample was 3,776 per square mile; a 1,000 increase in population density would increase densities by more than 25 percent.
21. There have been virtually no density increases of such a magnitude in municipalities that do not have broad expanses of undeveloped space.

communities and higher municipal expenditures per capita.

Table 3 B 1770

General Government Model: Expenditures per Capita
Dependent Variable: Spending

Variables	Coefficient	Mean	Std. Error	Probability	Statistical Significance	Practical Significance (Elasticity at the Mean)
POV%	1.223	0.10	0.60	0.04	95%	0.109
POP2000	0.00000010	82,731	1.7E-07	0.54		0.008
HAGE	-0.00032	32.91	1.9E-03	0.87		-0.009
L/SDGE	1.056	0.58	0.40	0.01	99%	0.547
S&FAID$	0.391	0.27	6.0E-02	0.00	99%	0.094
DENSITY	-0.000043	3,776	0.00	0.00	99%	-0.146
POP%	0.232	0.04	0.13	0.09		0.008
P/HHLD	-0.173	2.69	0.07	0.01	99%	-0.417
OWNOCC%	-0.543	0.62	0.23	0.02	95%	-0.304
HOUSE$	0.0000016	166,833	2.2E-07	0.00	99%	0.246
SR%	0.191	0.12	0.55	0.73		0.020
AREA	-0.00022	28.184	6.0E-04	0.71		-0.006
CRIME	6.102	0.05	0.91	0.00	99%	0.250
R-squared	.29	Mean D.V.	1.11			
Observations	738					

Interestingly, the inclusion of the three factors that measure the impact of the Current Urban Planning Assumptions add little to the explanatory value of the General Government Model as here specified. Only one—population density—was found to be statistically significant (and of little practical significance). Excluding these three variables (population density, population growth, and median housing age) and re-running the model with the remaining ten factors yields an R-squared of 0.24, meaning that the model as so specified explains only 24 percent of the measured expenditure variability from one municipality to another. Adding the three growth-related variables to these ten factors brings the R-squared up to only 0.29, meaning that the inclusion of the growth variables improves the explanatory value of the model by only five percentage points. This is not much of an impact for issues that are alleged to be having important effects on government costs in growing communities.

Wastewater Charges and Water Charges Models

Neither the Wastewater Charges Model nor the Water Utility Model indicated strong relationships between the identified factors and user charges, as Tables 8 and 9 demonstrate (see Appendix). The Wastewater Charges Model explained 12 percent of the variation in wastewater user charges per capita, while the Water Charges Model explained 8 percent of the variation in water charges per capita.[22] Thus, the Wastewater Charges Model failed to explain 88 percent of the variation in wastewater charges, and the Water Utility Model failed to explain 92 percent of the variation in water charges. This suggests that influences other than those variables included in the model explain much of the differences in utility costs from one community to another.

With respect to the Current Urban Planning Assumptions, only density was found to be statistically significant, but of little practical significance. In the Wastewater Charges Model, density exhibited a practical significance of minus 18.0 percent, consistent with Current Urban Planning Assumption #1. Similarly, density's practical significance of minus 12.5 percent in the Water Utility Model was consistent with Current Urban Planning Assumption #2 (Tables 2, 8, and 9). However, this translates into only small impacts on consumer costs. A 1,000 person-per-square-mile difference in average population density is associated with a $6 difference in annual wastewater charges per capita, or fifty cents per month.

22. There were 764 wastewater observations (Wastewater Charges Model) and 713 water (Water Charges Model) observations.

In other words, a 1,000 person-per-square-mile difference is associated with an annual water charge difference of $4 per capita, or thirty-three cents per month—less than a penny per day. Obviously, such trivial savings in waste water and water-related costs cannot justify public policies that would force major changes in existing lifestyles or land-use patterns.

It is particularly significant that none of the Current Urban Planning Assumptions were associated with a statistically significant relationship with the variation in Wastewater Charges or Water Charges. These infrastructure functions are among those cited most often in claims that suburbanization imposes additional costs.

Alternative Measures of Relationship: A Nominal Ranking Analysis

Another way to analyze the same data is to rank it by categories that reflect varying degrees of difference in some of the key independent variables (such as density) and relate these categories to the different cost measures that comprise the key dependent variables. The existence or absence of any obvious trends indicates how strong or weak the relationships are. Using the same Census data, a nominal (ranking) analysis by quintiles (20 percent rankings) was performed on the sample to determine whether the statistical relationships that the Current Urban Planning Assumptions would predict are actually evident in the data (Table 4).

As the nominal rankings reveal, none of the growth-related variables show the relationship with municipal expenditures that is predicted by the Current Urban Planning Assumptions. This confirms the findings of the econometric analysis, which was only able to explain a relatively small fraction of the cost differences among communities, and where only one of the growth-related variables (population density) was found to be statistically significant, but not practically significant, at conventional confidence intervals.

Table 4 B 1770

Summary of Nominal Analysis Results: General Government Expenditures per Capita, 2000

Population Density	Average Density (Population per square mile)	Nominal Analysis: Actual Expenditures	Rank: Actual Expenditures
Highest (1)	9,086	$1,180	4
Higher (2)	4,160	$979	1
Middle (3)	2,883	$1,045	2
Lower (4)	1,860	$1,094	3
Lowest (5)	900	$1,265	5
Average (Mean)	3,776	$1,112	
Maximum Difference		29.2%	

1990–2000 Growth	Average Growth	Nominal Analysis: Actual Expenditures	Rank: Actual Expenditures
Lowest (1)	-0.6%	$1,131	4
Lower (2)	0.5%	$1,190	5
Middle (3)	1.4%	$1,120	3
Higher (4)	2.7%	$1,032	1
Highest (5)	14.9%	$1,089	2
Average (Mean)	3.8%	$1,112	
Maximum Difference		15.3%	

Municipality Age	Average Age	Nominal Analysis: Actual Expenditures	Rank: Actual Expenditures
Highest (1)	54.8	$1,252	5
Higher (2)	42.4	$1,142	4
Middle (3)	31.9	$1,120	3
Lower (4)	22.8	$1,026	2
Lowest (5)	12.6	$1,021	1
Average (Mean)	32.9	$1,112	
Maximum Difference		22.7%	

- **Population Density.** The Current Urban Planning Assumptions would predict that the lowest expenditures per capita would be in the highest population density quintile. In fact, expenditures per capita in the highest density quintile were the second *highest,* and were above average.

Only the lowest density quintile (#5) had higher municipal expenditures per capita. It should be noted that the population density of quintile #5 is very low, and below the general U.S. Census Bureau urbanized area threshold of 1,000 persons per square mile. Expenditures per capita were lower than average in the middle three quintiles, which are more reflective of the suburban population densities that have developed in the United States since 1950. The lowest expenditures per capita were in quintile #2—the second-highest density quintile. This quintile's average density is comparatively low—approximately 10 percent above the average density for the entire database and more than 40 percent lower than the average density of U.S. urbanized areas with populations over 500,000 in 1950.[23] The implication is that higher density does not lower local government expenditures per capita.

- **Population Growth Rate.** The actual expenditure data indicate that quintile #1 (which has the lowest population growth rate) has the second highest expenditures per capita—at a level above the average. Like the population density conclusion, the actual spending data are inconsistent with what would be expected based upon the Current Urban Planning Assumptions.
- **Municipality Age.** Municipality age provides the most stark inconsistency with the Current Urban Planning Assumptions. The oldest municipalities (quintile #1) have the highest expenditures per capita, precisely the opposite of what would be expected. The lowest expenditures per capita are in the newest communities (quintile #5), which is also the opposite of what the Current Urban Planning Assumptions would predict.

The most dense municipalities (quintile #1) also failed to have the expected lowest wastewater charges per capita or the lowest water charges per capita. Quintile #1 municipalities did, however, have lower than average wastewater charges, though only of $7 per capita per year—hardly rising to the level of "unaffordable." There was little difference between the quintiles in water charges per capita. (See Tables 10 and 11 in Appendix.) Thus, the pattern in the nominal data (actual ranked data) for utilities was different than predicted by the econometric analysis.

Thus, the actual expenditure data reveal that more dense, slower growing, and older municipalities do not have lower expenditures per capita—the opposite of what would be expected if the Current Urban Planning Assumptions were correct. [24]

Table 5 B 1770

Nominal Analysis Results: Local Government Employee Compensation

Population Density	Average Density	Estimated Wages & Salaries
Highest (1)	9,086	$457
Higher (2)	4,160	$357
Middle (3)	2,883	$349
Lower(4)	1,860	$347
Lowest (5)	900	$321
Average (Mean)	3,776	$366

1990–2000 Growth	Average Growth	Estimated Wages & Salaries
Highest (1)	-0.6%	$410
Higher (2)	0.5%	$450
Middle (3)	1.4%	$373
Lower(4)	2.7%	$312
Lowest (5)	14.9%	$285
Average (Mean)	3.8%	$366

Municipality Age	Average Age	Estimated Wages & Salaries
Lowest (1)	54.8	$493
Lower (2)	42.4	$386
Middle (3)	31.9	$377
Higher (4)	22.8	$297
Highest (5)	12.6	$277
Average (Mean)	32.9	$366

23. Calculated from U.S. Census Bureau data.

Other Potential Municipal Expenditure Drivers

The fact that the econometric analysis explains so little of the variation in municipal costs per capita, combined with the fact that the highest density, slowest growing, and oldest communities do not have the lower expenditures per capita predicted by the Current Urban Planning Assumptions, would seem to indicate that other factors are more important drivers of variation in municipal costs between communities.

The most obvious place to look is local government employee compensation. Employee compensation is by far the largest expenditure function for most local governments, consuming, on average, 64 percent of total current expenditures.[25] Employee compensation is approximately 3.5 times capital expenditures.[26]

Employee compensation varies significantly between jurisdictions. Census Bureau information indicates that local government average wages and salaries for similar positions and skills vary by as much as 93 percent between some states.[27] These cost disparities are not necessarily explained by regional differences. For example, in the Denver metropolitan area the municipality with the highest wages and salaries per capita pays nearly 1.5 times the area average, and more than five times the municipality with the lowest wages and salaries per capita. Further, there are also significant differences (up to 123 percent) between the percentage add-on of employer-paid employee benefits costs among local governments by state.[28]

There are other factors that could be responsible for such large variations. There could be significant variations between the numbers of hours actually worked by government employees. This is evident at the state level, where differences of up to 38 days annually have been shown.[29] Thus, it seems likely that differences in municipal government employee compensation per capita could be an important factor in explaining differences in municipal expenditures.[30] Finally, there could be significant variations in the number of employees, or in employee productivity.

Although the available data cannot be used to econometrically test the impact of public employee compensation on municipal costs, the nominal ranking analysis used in the previous section can be extended to include a review of government employee compensation.[31] Table 5 provides an estimate of per-capita municipal employee wages and salaries for each set of quintile rankings for the three urban planning, growth-related variables.

As the data in Table 5 illustrate, virtually all of the difference between the highest municipal expenditure quintile and the lowest is accounted for (or more than accounted for) by the difference in municipal employee compensation per capita. This indicates that differences in employee com-

24. It has been suggested by some that older, more densely populated municipalities subsidize newer, more suburban municipalities. In fact, however, the nominal analysis indicates the opposite. The quintile of municipalities with the highest state and federal aid per capita average 45 years old ($852 annually per capita). This is nearly four times that of the second quintile (36 years and $218). The three lowest state and federal aid quintiles have average ages of from 26 to 31 years.

25. Calculated from U.S. Census Bureau data for 2000, adding the state and local government employer-paid employee benefits factor calculated from the National Income and Product Accounts.

26. Includes the cost of building new water and wastewater systems.

27. Calculated from U.S. Census Bureau 2001 government employee database.

28. The latest available comprehensive information on local government employer-paid employee benefits was the 1987 U.S. Census of Governments, from which this figure was calculated.

29. Wendell Cox and Samuel A. Brunelli, *America's Protected Class III* (Washington, D.C.: American Legislative Exchange Council, 1994), p. 29, Table C-3. No similar data have been published for localities.

30. It is also likely that differences in hourly employee compensation per capita would be an important determinant of differences in other government total expenditures, such as at the county, school district, township (and comparable governments) and special district levels.

Table 6 B 1770

Variation in Municipal Expenditures and Wages and Salaries per Capita: Top Quintiles

Local Government Expenditures per Capita

Assumed Association with Lowest Spending per Capita (Current Urban Planning Assumption #)	Actual	Average	Difference	Consistent with Current Urban Planning Assumption
#1: Highest Density Quintile	$1,180	$1,112	$68	NO
#2: Slowest Growth Quintile	$1,131	$1,112	$19	NO
#3: Oldest Communities Quintile	$1,252	$1,112	$140	NO

Estimated Wages & Salaries per Capita

Assumed Association with Lower Spending per Capita	Estimate	Average	Difference	Compared to Difference in Expenditures
#1: Highest Density Quintile	$457	$366	$91	134%
#2: Slowest Growth Quintile	$410	$366	$44	232%
#3: Oldest Communities Quintile	$493	$366	$127	91%

pensation—not growth factors—may be the strongest driver of municipal expenditures.

- **Population Density.** Wages and salaries per capita tend to rise from quintile 5 (lowest) to quintile 1, which has, by far, the highest expenditures in the highest density quintile.
- **Population Growth Rate.** The highest wage and salary expenditures per capita are in the slowest growing quintiles (quintiles 1 and 2), and lowest in the fastest growing quintiles (quintiles 4 and 5).
- **Municipality Age.** As illustrated in Figure 1, the highest wage and salary expenditures per capita are in the oldest municipalities (quintiles 1 and 2), with the lowest expenditures in the newest municipalities (quintiles 4 and 5).

Each of these conclusions works strongly against what one might expect from the Current Urban Planning Assumptions. This is illustrated by reviewing the data for the quintiles under each Current Urban Planning Assumption that would be expected to have the lowest expenditures per capita. Table 6 indicates that differences in employee compensation alone are more than sufficient to account for the differences in municipal expenditures per capita—whether by density, population growth, or municipality age.

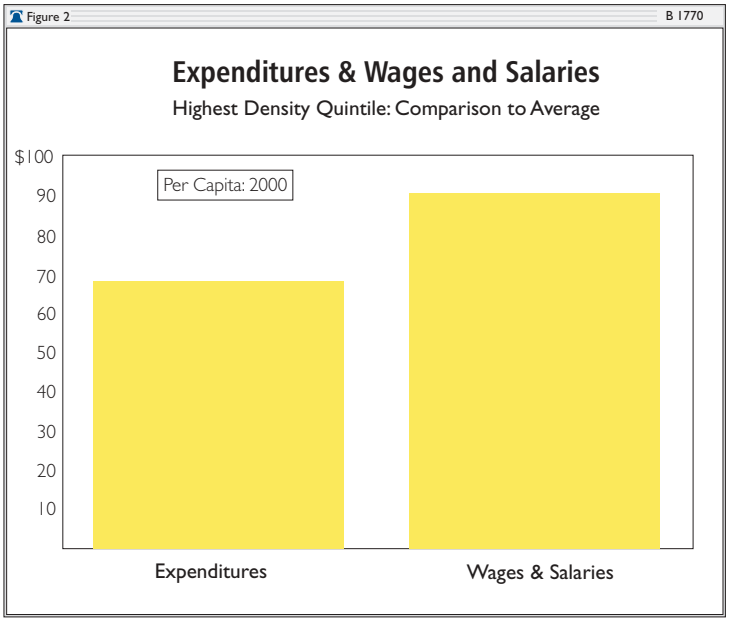
- **Population Density.** The variation from the average in wages and salaries per capita in the highest density municipalities is larger (1.34 times) than the variation from the average for the same municipalities in local government expenditures, as shown in Figure 2.
- **Population Growth Rate.** The variation from the average in wages and salaries per capita in the slowest growing municipalities is larger (2.32 times) than the variation from the aver-

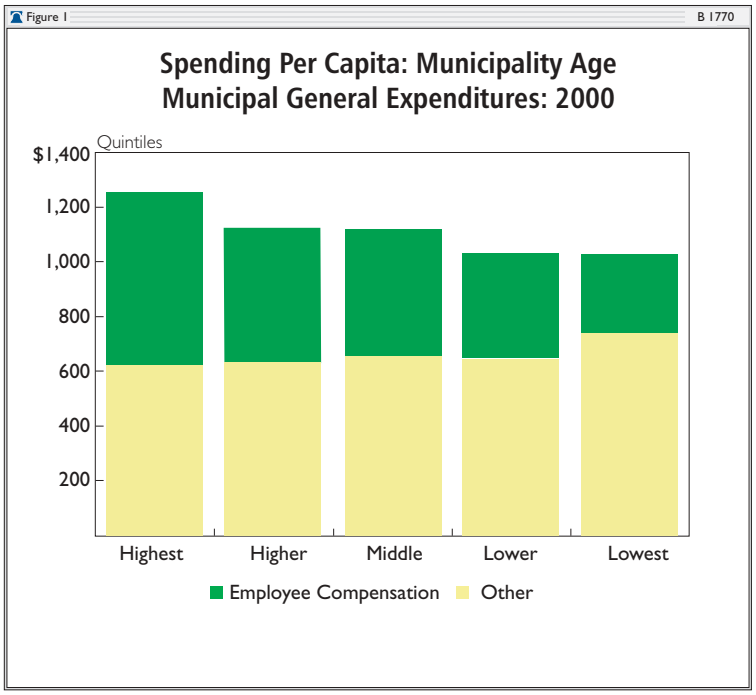
31. Employee compensation is estimated using the gross local government wages and salaries data from the Census Bureau database, scaled downward to exclude utilities and education and increased by the average 24.5 percent cost of employer paid employee benefits. Because wastewater and water expenditures are small compared to overall municipal expenditures, it was not considered reliable to estimate wages and salaries for these functions using the same formula.

age for the same municipalities in local government expenditures.

- **Municipality Age.** The variation from the average in wages in salaries per capita in the oldest municipalities is nearly as large (0.91 times) as the variation from the average for the same municipalities in local government expenditures. If the average employer-paid benefits add-on is included, the variation in employee compensation would be larger than the difference in expenditures (1.12 times).

In fact, the impact of increases in local government employee compensation has been far greater than the sprawl-based costs projected in *Costs of Sprawl—2000*. From 1980 to 2000, the gross additional local government employee compensation alone in the United States was nearly $2.2 trillion (in 2000 dollars)—or more than $105 billion per year. This is approximately 12 times the $9.1 billion average annual additional cost projected in *Costs of Sprawl—2000*.[32]





An Alternative Explanation for Differences in Municipal Spending: Political Entrenchment

The generally higher spending levels of the older municipalities may be due to a process of "political entrenchment" that occurs with the passage of time. The large impact of local government employee compensation indicates that internal employee interests may be a principal factor driving municipal expenditures per capita. According to the nominal ranking analysis presented in Table 7, there appears to be a strong relationship between higher employee wages and salaries per capita and higher density, lower population growth rates, community age, and higher population—all of which are in opposition to what would be expected if the Current Urban Planning Assumptions were correct.

- **Population Density.** The highest wages and salaries quintile has the highest population density. Densities decrease with each quintile, with the

32. Estimated from U.S. Department of Commerce data. Assumes a constant rate of annual increase from 1980 to 2000.

lowest wages and salaries quintile having the lowest population density.

- **Population Growth Rate.** The highest wages and salaries quintile has the lowest population growth rate. Population growth rates increase with each quintile, except for the highest growth quintile (quintile 5). The second-fastest growing quintile (quintile 4) has the highest population growth rate.
- **Municipality Age.** The highest wages and salaries quintile has the oldest average municipality age. Community age decreases with each quintile, with the lowest wages and salaries quintile being the youngest.

Table 7 B 1770

Nominal Analysis Results: Estimated Wages & Salaries per Capita: Quintiles

Quintile	Estimated Wages & Salaries	Expenditures	Density	Growth Rate	Municipality Age	Population
Highest (1)	$0.693	$1,821	4,802	1.1%	42.0	131,202
Higher (2)	$0.424	$1,235	3,887	2.4%	35.4	100,495
Middle (3)	$0.324	$1,059	3,699	3.0%	33.0	87,418
Lower (4)	$0.243	$802	3,172	4.5%	27.8	51,878
Lowest (5)	$0.147	$646	3,324	7.9%	26.4	42,630
Average (Mean)	$0.366	$1,112	3,776	3.8%	32.9	82,731

Perhaps reflecting such entrenchment, older municipalities have often been notably resistant to cost-effective management innovations such as privatization, competitive contracting, more flexible labor arrangements, and innovative management techniques.[33] For example, the oldest quintile of municipalities had a general government expenditure level 23 percent higher than the youngest (Table 5).

It must be pointed out, however, that employee compensation is not likely to be the only cost function that could be exercising undo special-interest influence on the costs of local governments. Other political interests not quantified (and perhaps not quantifiable) may also exercise an impact on municipal spending.

Larger governmental units—which also tend to be more dense and older[34]—may be inherently more susceptible to special-interest capture, whether employee, business, labor, or other. Generally, it can be expected that the influence of individual voters would be less in larger jurisdictions and that special interests would be more likely to exert control. Larger jurisdictions would seem to provide economies of scale for lobbying. It would seem reasonable that where there is greater opportunity for special-interest control, government costs are likely to be higher. The data in Table 7 indicate that the highest wages and salaries quintile (quintile 1) has an average population that is more than 50 percent larger than average, and that the average population of each succeeding quintile is lower. The lowest wages and salaries quintile (quintile 5) has the lowest population—approximately one-half the average. This finding is counter to another widely held urban planning assumption: that larger units of government are more cost effective due to economies of scale.

All of this seems to indicate that municipal costs are more susceptible to overwhelming influence by political interests than they are to economics.

33. This is illustrated by the case of public transit. In 2001, none of the approximately 100 older transit systems (established before 1980 or descended from pre-1980 systems) in major metropolitan areas competitively contracted their bus systems. By contrast, 56 percent of the newer, largely suburban systems competitively contract their bus systems. See Wendell Cox, *Performance Measures in Urban Public Transport,* paper presented to the 8th International Conference on Competitive and Ownership in Public Transport, Rio de Janeiro, 2003, at *www.publicpurpose.com/t8-gbc.pdf* (June 15, 2004).
34. This research indicates that the highest population quintile also has the highest population density and the highest expenditures per capita.

Theoretical studies, such as *Costs of Sprawl—2000* may suffer from what might be called the "length of pipe fallacy"—the assumption that labor rates, cost of materials, and the costs associated with apparently similar projects is the same in every local government jurisdiction in a metropolitan area.[35] In fact, older, inner-city government labor rates are often higher than suburban rates: Overheads may be higher and certainly the operating environment can be more challenging. For example, expansion of an inner-city sewer system is likely to be far more costly than laying a new one in a greenfield area.

"Entrenchment" may have first been noted by Adam Smith in *The Wealth of Nations*. He pointed out that historical control of guilds in the older cities had produced a situation in which prices were lower in the suburbs, which were beyond the reach of the guilds. This kept prices in the older cities above market levels.[36] Economist Mancur Olson similarly postulated that, as time goes on, political and special interests become more entrenched in older national governments.[37] Stronger bureaucracies, more powerful employee organizations, strong local business interests, political interests, and more rigid operating procedures may have developed over a longer time period. These may force costs in older municipalities to be higher than they would be in newer municipalities.

An "entrenchment" theory of municipal finance would be consistent with the findings of economist Charles Tiebout, who argued that people tend to "vote with their feet"—to move to newer communities that better meet their desires and needs. Relative tax levels were an important component of this thesis, which characterized the new suburban communities as competing with one another for new residents.[38]

Conclusions and Policy Implications

Our analysis indicates that the Current Urban Planning Assumptions are of virtually no value in predicting local government expenditures per capita. The lowest local government expenditures per capita are not in the higher density, slower growing, and older municipalities.

On the contrary, the actual data indicate that the lowest expenditures per capita tend to be in medium- and lower-density municipalities (though not the lowest density); medium- and faster-growing municipalities; and newer municipalities. This is after 50 years of unprecedented urban decentralization, which seems to be more than enough time to have developed the purported urban sprawl-related higher local government expenditures. It seems unlikely that the higher expenditures that did not develop due to sprawl in the last 50 years will evolve in the next 20—despite predictions to the contrary in *The Costs of Sprawl—2000* research.

It seems much more likely that the differences in municipal expenditures per capita are the result of political, rather than economic factors, especially the influence of special interests.

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35. For example, in Los Angeles—where many transit services are sponsored by newer, suburban agencies—costs per hour of service are 46 percent lower where provided under contract by agencies other than the core transit system Wendell Cox, *Competitive Participation in U.S. Public Transport: Special Interests Versus the Public Interest,* paper presented to the 8th International Conference on Competition and Ownership in Land Passenger Transport, Rio de Janeiro, 2003, at *www.publicpurpose.com/t8-cc.pdf* (June 15, 2004).
36. Adam Smith, *The Wealth of Nations* (New York: Modern Library, 1957), p. 129.
37. For example, such a theory is developed by Mancur Olson, *The Rise and Decline of Nations: Economic Growth, Stagflation and Social Rigidities* (New Haven and London: Yale University Press), 1982.
38. Charles M. Tiebout, "A Pure Theory of Local Government Expenditures," *Journal of Political Economy*, October 1956.

APPENDIX

Table 8 B 1770

Wastewater Charges Model: Wastewater Charges per Capita
Dependent Variable: Wastewater Charges

Variables	Coefficient	Means	Std. Error	Probability	Statistical Significance	Practical Significance (Elasticity at the Mean)
POP2000	0.000000022	82,569	2.1E-08	0.28		0.015
HAGE	-0.00027	32.86	2.7E-04	0.32		-0.074
DENSITY	-0.0000063	3,444	0.00	0.00	99%	-0.180
POP%	0.0027	0.03	0.02	0.90		0.001
P/HHLD	-0.024	2.68	0.01	0.00	99%	-0.531
OWNOCC%	-0.143	0.64	0.02	0.00	99%	-0.758
HOUSE$	0.000000021	162,517	3.0E-08	0.48		0.028
SR%	0.303	0.12	0.08	0.00	99%	0.303
AREA	-0.00017	28.382	7.9E-05	0.03	95%	-0.041
R-squared	0.12	Mean D.V.	0.12			
Observations	762					

Table 9 B 1770

Water Charges Model: Water Charges per Capita
Dependent Variable: Water Charges

Variables	Coefficient	Means	Std. Error	Probability	Statistical Significance	Practical Significance (Elasticity at the Mean)
POP2000	0.0000000056	85,584	2.1E-08	0.79		0.004
HAGE	-0.00013	31.96	3.0E-04	0.66		-0.036
DENSITY	-0.0000044	3,430	0.00	0.00	99%	-0.125
POP%	-0.0259	0.04	0.02	0.23		-0.008
P/HHLD	0.002	2.71	0.01	0.76		0.056
OWNOCC%	-0.114	0.64	0.03	0.00	99%	-0.605
HOUSE$	0.00000015	160,959	3.2E-08	0.00	99%	0.199
SR%	0.293	0.12	0.09	0.00	99%	0.286
AREA	-0.000024	29.277	8.2E-05	0.77		-0.006
R-squared	0.08	Mean D.V.	0.14			
Observations	713					

Table 10 B 1770

Summary of Econometric and Nominal Analysis Results: Wastewater Charges per Capita

Population Density	Average Density	Actual Expenditures	Rank: Actual Expenditures
Highest (1)	7,906	$114	2
Higher (2)	3,963	$109	1
Middle (3)	2,741	$117	3
Lower (4)	1,775	$127	4
Lowest (5)	844	$132	5
Average (Mean)	3,440	$121	
Maximum Difference		21.3%	

Table 11 B 1770

Summary of Econometric and Nominal Analysis Results: Water Charges per Capita

Population Density	Average Density	Actual Expenditures	Rank: Actual Expenditures
Highest (1)	8,031	$137	3
Higher (2)	3,873	$139	5
Middle (3)	2,695	$133	1
Lower (4)	1,736	$137	2
Lowest (5)	831	$139	4
Average (Mean)	3,430	$137	
Maximum Difference		4.8%	